

Appl. No.: 10/659,938  
Amtd. dated 02/07/2005  
Reply to Office action of 12/28/2004

## REMARKS

In the Office Action dated December 28, 2004, Claims 1-4, 6-18, 20-32, and 34-41 are pending. Claim 29 is objected to for an informality. Claims 1-3, 7, 12, 15-17, 20, 25, 28-31, 35, and 41 are rejected under 35 U.S.C. § 103(a) as being unpatentable over "TWI, Re-stir™ – reversal stir welding," of the IDS received November 5, 2003 (hereinafter "Re-stir"). Claims 8, 13, 21, 26-27, 36, and 39-40 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Re-stir in view of U.S. Patent Application Publication No. 2004/0074944 to Okamoto, et al. Claims 9-11, 22-24, and 37-38 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Re-stir in view of U.S. Patent Application Publication No. 2002/0125297 to Stol, et al. Claims 4, 6, 14, 18, 32, and 34 are indicated to be allowable.

Regarding the objection to Claim 29, Applicant is unable to identify the exact correction that is requested. If correction is required after entry of the above amendment, Applicant would appreciate the Examiner's clarification.

The independent Claims 1, 16, and 29 are amended to more clearly define the invention. In particular, Claim 1 now recites a method of friction stir welding in which a rotational speed of a welding pin is adjusted "cyclically between a minimum speed and a maximum speed with an average speed that is greater than zero." This feature is described, e.g., in connection with Figure 2 of the present application. As set forth in the application, Figure 2 illustrates an embodiment in which "the rotational speed of the pin 24 is cyclically adjusted or modulated, between a minimum speed  $S_{min}$  and a maximum speed  $S_{max}$ . For example, the rotational speed of the pin 24 can be decreased to the minimum speed  $S_{min}$  at times  $T_2$ ,  $T_4$ ,  $T_6$ , and increased to the maximum speed  $S_{max}$  at times  $T_3$ ,  $T_5$ ,  $T_7$ ." In particular, the average rotational speed  $S_{avg}$  can be midway between the minimum speed  $S_{min}$  and the maximum speed  $S_{max}$  as shown in Figure 2, and the pin can rotate in one direction or reverse direction.

Applicant respectfully submits that neither Re-stir nor the other cited references illustrate the claimed feature. Re-stir discloses a variant of friction stir welding that "may be applied as both angular reciprocating, where reversal is imposed within one revolution, and rotary reversal, where reversal is imposed after one or more revolutions." The technique that "provides a cyclic

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and essentially symmetrical process." For example, Re-stir describes a welding operation in which the probe is actuated "at a travel speed of 3.3 mm/sec (198 mm/min) and at 10 revolutions per interval" to form "an essentially symmetric weld." Figure 4b of Re-stir "shows the effect of the change in the direction of rotation." Re-stir does not teach or suggest rotating the probe to different speeds in the opposite directions or otherwise adjusting between the rotational speed to achieve "an average speed that is greater than zero" as claimed. Nor do the other cited references disclose this feature. Thus, Applicant respectfully submits that Claim 1 is allowable over each of the cited references, as are each of the dependent Claims 1-4, 6-15

The independent Claims 16 and 29 have been amended similarly, and therefore are allowable for the same reasons, as are each of the dependent Claims 17-18, 20-32, and 34-41.

In addition, Claim 7 as amended recites that the minimum speed is "greater than zero and in the same direction as the maximum speed, such that the pin rotates in a single direction." This feature, which is also recited in Claims 20 and 35, is also not taught by Re-stir. Therefore, these claims are allowable for this additional reason.

The other amendments reflected above are wholly unrelated to the patentability of the claims. In particular, punctuation that was inadvertently omitted from Claim 34 has been added. Also, in each of the independent Claims, the phrase "at a frequency of between 0.1 and 100 Hz" has been amended to recite "at a frequency of variation between about 0.1 Hz and 100 Hz" to more adopt the terminology that is used primarily throughout the application. The claims are not substantively affected by this change.

Accordingly, Applicant respectfully submits that each of the pending Claims 1-4, 6-18, 20-32, and 34-41 is allowable for the reasons set forth above.

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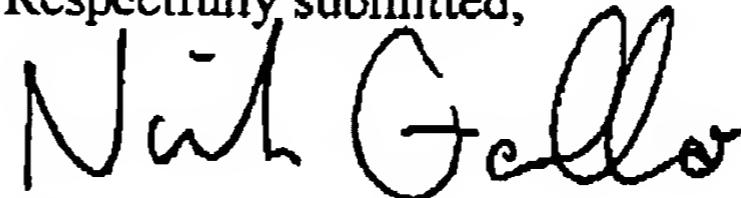
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### CONCLUSIONS

In view of the remarks presented above, Applicant submits that the pending claims are allowable and the present application is in condition for allowance. As such, the issuance of a Notice of Allowance is therefore respectfully requested. In order to expedite the examination of the present application, the Examiner is encouraged to contact Applicant's undersigned attorney in order to resolve any remaining issues.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,



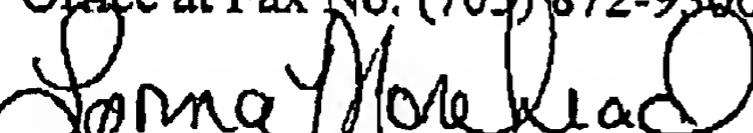
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